

# Household Refrigeration

A COMPLETE TREATISE ON THE PRINCIPLES, TYPES, CONSTRUCTION  
AND OPERATION OF BOTH ICE AND MECHANICALLY COOLED DOMES-  
TIC REFRIGERATORS, PROPERTIES OF REFRIGERANTS, THE AP-  
PLICATION OF THERMODYNAMICS AND PHYSICAL CHEMIS-  
TRY TO REFRIGERATION, HEAT TRANSMISSION AND  
VALUES OF INSULATING MATERIALS, FOOD TECH-  
NOLOGY, DESCRIPTION OF MODERN HOUSEHOLD  
REFRIGERATING MACHINES OF THE COMPRES-  
SION AND ABSORPTION TYPES, THE PRIN-  
CIPLES OF AIR CONDITIONING, INCLUD-  
ING A DESCRIPTION OF THE EQUIP-  
MENT AND ITS APPLICATION  
FOR THE OFFICE, RESI-  
DENCE AND COMMER-  
CIAL ESTABLISH-  
MENT.

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**General Electric.**—The General Electric refrigerator is made by the General Electric Co., Schenectady, N. Y. The sales offices are at Cleveland, Ohio; and the manufacturing plants at Erie, Pa., and Ft. Wayne, Ind.

The General Electric refrigerating unit is designed to occupy little space; eliminate exposed moving parts; reduce necessity for attention to a minimum; make an interchange of units simple and easy; provide constant refrigerating tempera-

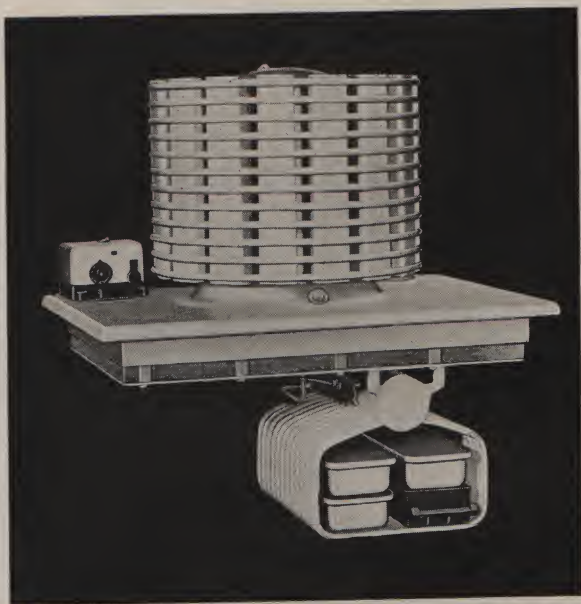


FIG. 70.—GENERAL ELECTRIC ICING UNIT.

tures automatically and at a low operating cost; reduce the possibility of gas leaks and other causes of failure to a minimum. There are four principal parts to the General Electric refrigerating unit, namely: The compressor and condenser, the float chamber, the chilling unit, and the control.

Fig. 70 shows the exterior and Fig. 71 a cut-away view of a typical refrigerating unit.

The function of the compressor unit is to compress the refrigerant vapor so that it will liquefy on being cooled in the

surrounding condenser coil. The single oscillating cylinder compressor is connected directly to the motor by a steel crank-

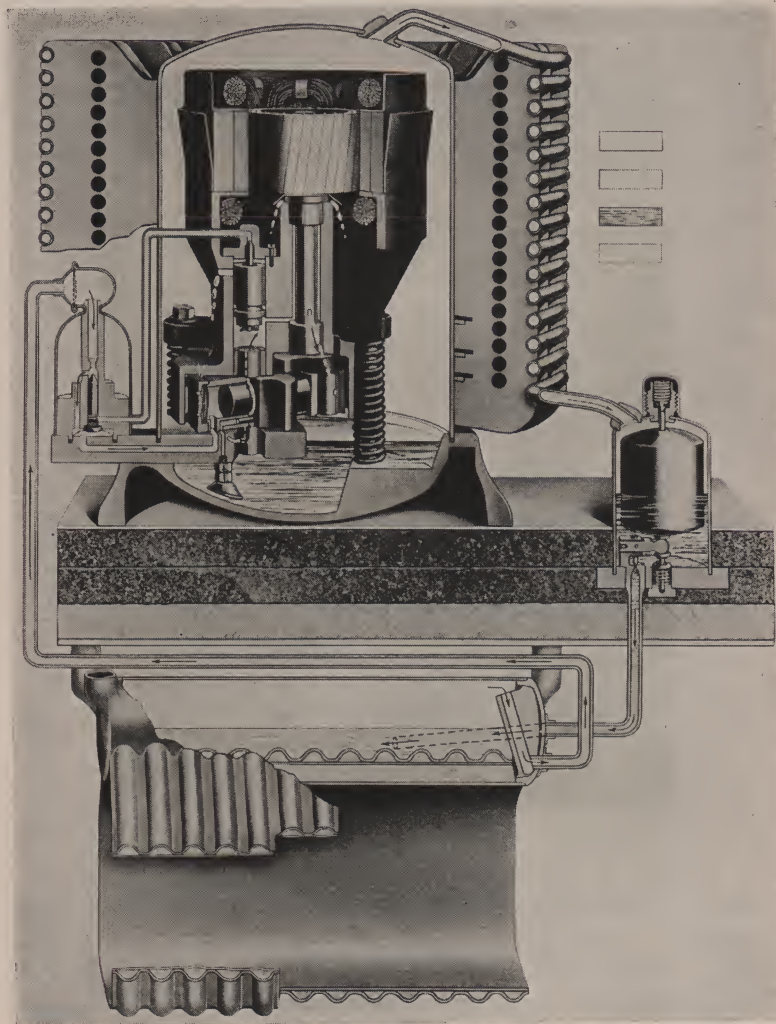


FIG. 71.—CUTAWAY VIEW GENERAL ELECTRIC ICING UNIT.

shaft which is heat-treated, hardened and ground. This very simple piece of mechanism is sealed in a drawn-steel case, with a drop-forged base.



Heat from the compressed vapor is dissipated from the condenser coils which are rigidly wound on steel fins welded to the outside of the compressor case. These fins serve the double purpose of supporting the condenser coils and dissipating heat from the motor and condenser.

Forced lubrication is obtained by means of a plunger fixed to the bearing end of the piston, which pumps oil from the permanent oil supply to all of the bearing surfaces.

All of the mechanism within the steel case is mounted on a three-point spring support, thereby rendering the machine unusually quiet.

The float chamber is located on the cabinet top to the right of the compressor case. Its function is to accumulate liquefied refrigerant until there is a sufficient quantity to raise the float valve, thereby allowing the liquid to return to the chilling unit.

The chilling unit, or super-freezer, is located on the under side of the cabinet cover as an integral part of the whole refrigerating unit. Its function is to refrigerate the cabinet. It is made of two steel sheets, one of which is corrugated. These are folded into shape, with the upper part of the inner and outer sheets forming a cylindrical header, and are then electrically welded and brazed together. This construction gives, in effect, a series of parallel tubes extending around the outer surface of the super-freezer and opening into the header or refrigerant reservoir.

The liquid refrigerant is admitted from the float chamber into the super-freezer where it evaporates, absorbing heat from the interior of the cabinet. The interior of the super-freezer is made to accommodate four ice freezing trays, two of which are set side by side and in direct contact with the super-freezer for fast freezing.

The control is located on the cabinet top at the left of the compressor and consists of:

1. A switch to throw the unit "on" or "off" manually.
2. A thermostat to start and stop the motor in response to temperature changes in the super-freezer when the manually controlled switch is "on."
3. An overload protective device.
4. A starting relay.

Temperature control is accomplished by a metallic bel-

lows, to which is attached a copper tube, the end of which is fastened to the super-freezer. The bellows and tube contain a supply of sulphur dioxide, the same as is used for refrigerant in the machine proper. An increase in the temperature of the super-freezer causes the sulphur dioxide to evaporate, with a resultant increase in the pressure. This increase in pressure



FIG. 72.—GENERAL ELECTRIC CABINET AND UNIT.

actuates, through the metallic bellows, a switch which starts the motor. Conversely, a decrease in temperature causes a reduction in pressure, which opens the switch and stops the motor. The temperature may be adjusted by increasing or decreasing the tension on the temperature adjusting spring. This may be accomplished by means of the temperature adjusting dial knob, which is on the front of the control. This allows the

owner to adjust the cabinet temperature by a simple movement of the dial.

The motor is protected against overload by means of an overload trip which opens the circuit when any abnormal condition arises.

The purpose of the starting relay is to close the starting contacts and thereby energize the starting winding and supply the additional torque necessary to bring the motor up to speed.

In the case of the smaller units, a resistance, located in the control box, is in circuit with the starting winding. In the larger units, one point of a capacitor is in circuit with the starting winding. Then, when the motor has come up to speed, the starting winding is connected to another point on the capacitor unit and thereafter the motor runs as a polyphase motor.

The capacitor on the large units serves the purpose of increasing the power factor and decreasing the starting and running current.

Fig. 72 shows a typical all-steel cabinet. The inner and outer shells of heavy steel are electrically welded into one complete assembly. The insulation is between these two steel shells. Interiors are porcelain on steel and exteriors are of "Sanak" or porcelain. Cabinets are made in a line of sizes from  $3\frac{1}{4}$  to 120 cu. ft. of food storage capacity.

**General Electric.**—Fig. 73 shows a cut-away section and Fig. 74 an exterior view of the HT-70 refrigerating unit.

This refrigerating machine is of the "Monitor Top" design and construction. It is hermetically sealed.

The refrigerant is methyl formate, developed for this use by the General Electric laboratories. It is a low-pressure refrigerant with a boiling point of  $80^{\circ}$  F. at atmospheric pressure.

The compressor is located on the high-side of the system. It is of the rotary type, developed especially to handle this new refrigerant. The movable element, the oscillator, is actuated by an eccentric on the vertical shaft. It oscillates rather than rotates, being keyed to the cylinder by a sliding blade. The compressor is spring-mounted within the steel case, and is carefully balanced so that no vibration is transmitted to the



exterior. Oil, under pressure, lubricates every moving part. The compressor is mounted directly below the motor on the vertical shaft. The cylinder is circular in form and is concentric with the center of the shaft. The oscillator of the com-

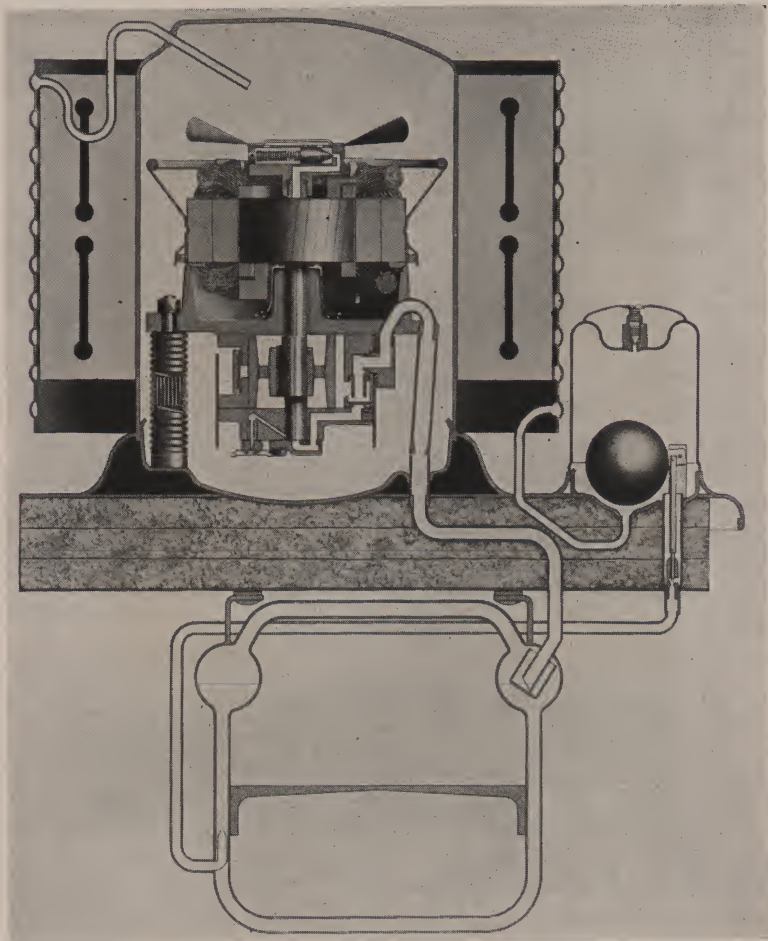


FIG. 73.—CUTAWAY SECTION G. E. H-T-70 REFRIGERATING UNIT.

pressor is cylindrical in form and is mounted on the eccentric of the shaft. The oscillator is keyed to the cylinder so that it oscillates but does not rotate, following around the cylinder wall as the shaft rotates.

The motor is mounted directly above the compressor on the vertical shaft. It operates as a resistance split-phase induction motor during starting, and as a single-phase induction motor during normal running. The proper resistance is incorporated in the starting winding so that an external resistor is not needed.

A float valve is used to control the refrigerant supply to the evaporator. This valve is located on the high-side of the system.

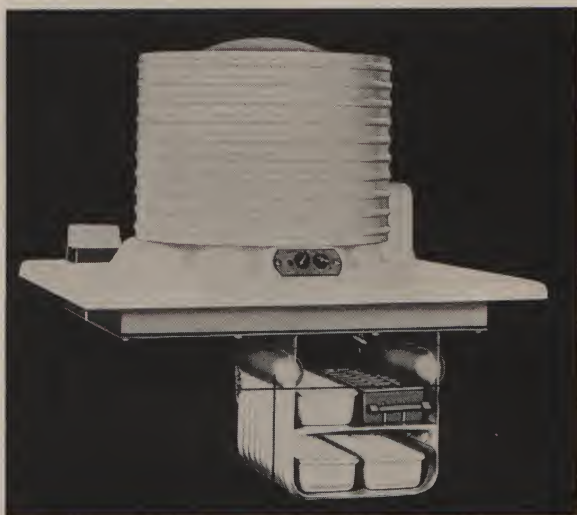


FIG. 74.—GENERAL ELECTRIC H-T-70 REFRIGERATING UNIT.

The chilling unit is made of stainless steel with an aluminum freezing shelf. The chilling unit is constructed to incorporate forced circulation of the refrigerant.

The condenser is of smooth construction made possible by the use of the low-pressure refrigerant.

The control is located on the front of the machine. It is completely sealed. Included in the control are a manual switch for turning the machine on or off; an adjustable automatic mechanism for regulating the chilling unit and cabinet air temperatures; a device for protecting the motor from abnormal load or power conditions, and a semi-automatic arrangement for defrosting the chilling unit.



The cabinet, Fig. 75, is of all-steel construction with a one-piece acid-resistant porcelain enamel interior and porcelain enamel paneled exterior. Semi-concealed hinges and a simple fingertip handle latch are features included in this cabinet. Textolite door strips are used. Sliding shelves with the feature

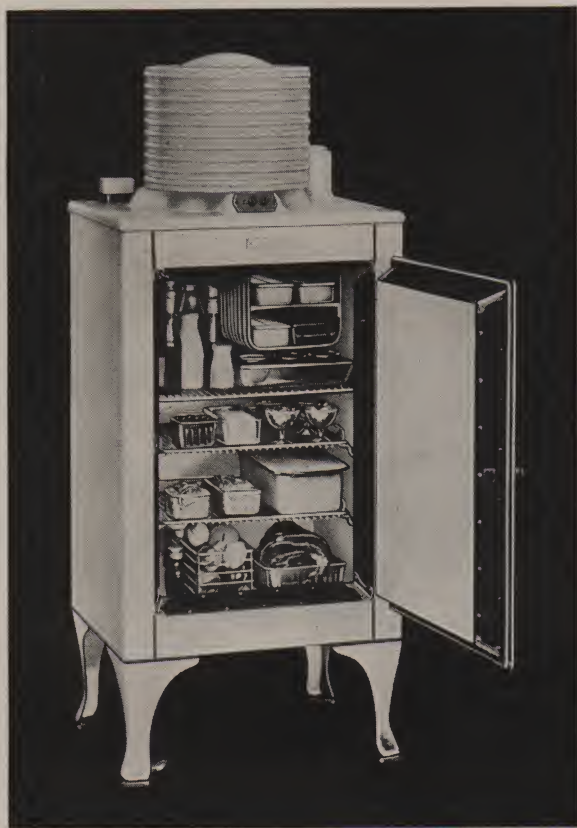


FIG. 75.—GENERAL ELECTRIC CABINET AND UNIT.

of adjustable shelf spacing are introduced. The foot pedal door opener is an added convenience. Automatic lighting of the cabinet interior occurs as soon as the cabinet door is opened.

**General Electric.**—Fig. 76 is an exterior view of the refrigerating unit used on the "Junior" line manufactured by the General Electric Co.

The compressor is of the rotary type and operates totally submerged in oil. The compressor consists essentially of the following parts: Shaft, piston, blade, cylinder, end flanges. The only valve in the compressor is an exhaust valve of the disc type. It is about the size of a dime and held in place by a small helical spring. The intake port is an unrestricted hole in the cylinder wall. The cylinder and the end plates which

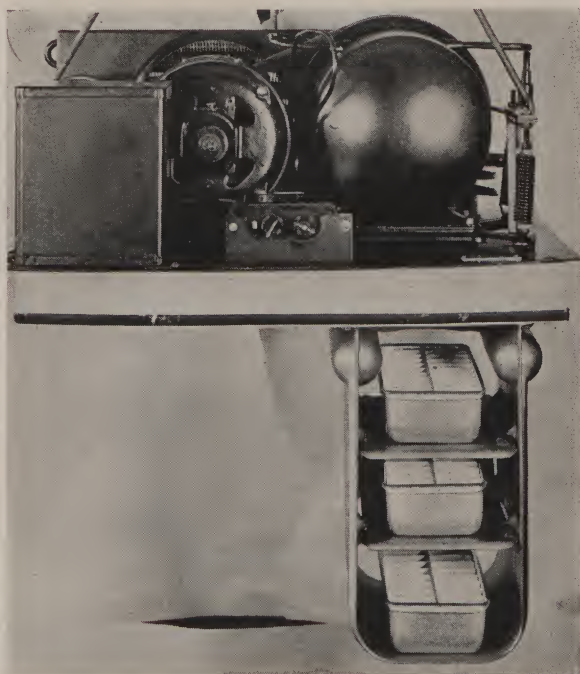


FIG. 76.—GENERAL ELECTRIC JUNIOR REFRIGERATING UNIT.

carry the shaft bearings are stationary. It might be said that the cylinder and the end plates form the gas compartment in the compressor. The piston is used to push the gas from this compartment, and the blade is a dividing member which helps the piston clear the compartment. The motor is  $1/6$ -hp. and of the capacitor type. The condenser is of the finned type. The float is of the "high-side" type. The evaporator is made from stainless steel and is equipped with refrigerated shelves to insure rapid freezing. The check valve is of the disc type

and is located in the suction line just outside the compressor case. The shaft seal uses a special alloy metal which is soldered to the shaft, and the bellows contains a hardened steel nose piece which seals against the special alloy ring. The spring which holds the nose piece against the special alloy ring is located in the back of the shaft. There is a solid space

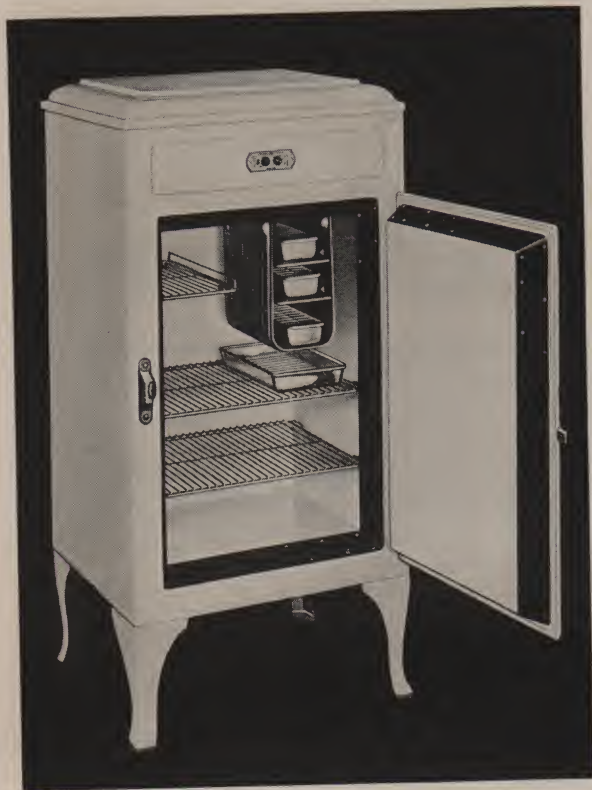


FIG. 77.—GENERAL ELECTRIC JUNIOR CABINET AND UNIT.

in the bellows so designed to give ample flexibility to the nose piece. The shaft seal is submerged in oil so that any visible leak will be oil and not gas.

Fig. 77 shows a typical cabinet. The food compartment door is open affording a view of the shelf arrangement and of the evaporator. This line of refrigerators includes three sizes of 4, 5 and 7 cu. ft. of food storage space.